Remarks

Claims 1, 2, and 5-7 are pending in the application, of which claim 1 is in independent form.

Claims 1, 2, 5, and 6 stand rejected under 35 U.S.C. § 112, first paragraph, for failure to comply with the written description requirement. This rejection is a copy of the rejection set forth in paragraphs 2 and 3 of the November 22, 2005 Office action, to which applicant responded in his March 31, 2006 amendment deleting the terminal clause of claim 1. Applicant respectfully submits that this rejection mistakenly refers to subject matter previously deleted from claim 1 and requests, therefore, that this rejection be withdrawn.

Claims 1, 2, and 5-7 stand rejected under 35 U.S.C. § 103(a) for obviousness over International Publication No. WO 98/52240 ("WO '240") in view of JP 02-155161 ("JP '161") and U.S. Patent No. 3,351,495 to Larsen et al. ("Larsen et al."). The Examiner relies on WO '240 for description of a battery separator comprising a polymer web made from UHMWPE, a silica component, and an antioxidant. Acknowledging that WO '240 does not disclose the web as coated with an antioxidant material, the Examiner relies on JP '161 (which corresponds to Japanese Patent Application No. 1988-309711 of Nippon Muki) for description of a polymer web coated with paraffin oil containing antioxidant material and phosphoric acid-type peroxide decomposer to keep the battery separator from oxidizing deterioration. The Examiner proceeds to calculate the antioxidant material-to-UHMWPE ratio of two proposed antioxidant material-coated polymer webs created by combination of each of two examples of webs set forth in WO '240 with a coating taken from Sample No. 8 of JP '161. The Examiner computes for the two proposed combinations antioxidant material-to-UHMWPE ratios that fall well below the 0.17 minimum recited in claim 1.

Attempting to increase the antioxidant material-to-UHMWPE ratio above the 0.17 minimum, the Examiner relies on Larsen et al., which at column 1, lines 50-53, states that the battery separator described in Larsen et al. contains 0-15 weight percent antioxidant, based on the weight of the polyolefin. (Larsen et al. does not describe application of an antioxidant coating.) Using the Larsen et al. 15 weight percent antioxidant limit to adjust the two proposed combinations, the Examiner recomputes antioxidant material-to-UHMWPE ratios of 0.19 and 0.2, which exceed the 0.17 minimum claimed. The Examiner concludes that it would have been obvious "to use antioxidant material in combination with the polymer in an amount as disclosed in Larsen [et al.]

motivated by the desire to prevent oxidizing deterioration at high temperature." (Office action at 6.) Applicant traverses this rejection because (1) Larsen et al. contemplates neither UHMWPE nor an antioxidant coating; (2) Larsen et al. gives 21 examples of battery compositions, none of which exceeds 1.15 percent of the weight of polyolefin; (3) even if the 15 percent maximum antioxidant concentration specified by Larsen et al. is used, it still is less than the 0.17 minimum claimed; (4) JP '161 limits the antioxidant content to no greater than 1 percent; (5) prior art forming the basis of other rejections supports a relatively low antioxidant material polyethylene ratio; and (6) the product applications bulletin of applicant's exemplary Irganox 1010 antioxidant specifies less than 1 percent concentration of antioxidant in high density polyethylene products.

More specifically, Larsen et al. at column 2, line 54 - column 3, line 8 specifies a battery separator made from "high molecular weight polyolefin" having a molecular weight of at least 300,000. A "particularly preferred embodiment" is polyethylene having an average molecular weight of 2,000,000. Claim 1 recites UHMWPE, which by definition has a molecular weight of greater than 3,100,000 (see paragraph 8 of the March 29, 2006 37 C.F.R. § 1.132 Declaration of Richard W. Pekala) ("Pekala declaration").

Larsen et al. also states at column 1, lines 52-53, immediately after stating the 0-15 weight percent antioxidant on which the Examiner relies, that "[i]n a preferred embodiment, [antioxidant in an amount of] 0.1 percent by weight is employed."

From column 10 - column 17, Larsen et al. gives 21 examples of battery separator compositions made of polyolefins having average molecular weights of between 300,000 and 2,000,000 and antioxidants in amounts of between 0.1 percent and 1.15 percent of the weight of the polyolefin.

Larsen et al. at column 9, lines 67-75, and in Table IV summarizes results of an oxidation test performed on a battery separator made from polyethylene having an average molecular weight of 2,000,000 and IONAL antioxidant (described at column 3, lines 57-62) in an amount of 0.95 percent by weight of the polyethylene. (The battery separator composition is that of Example 18.) All of Larsen et al.'s examples use, therefore, antioxidant material-to-polyolefin ratios that are substantially closer to the preferred embodiment of 0.1 percent by weight of the polyethylene, not the 15 percent mentioned in the single general statement the Examiner relies on.

Moreover, even if it is proper to rely on the 0-15 weight percent antioxidant range of Larsen et al., the 0.17 minimum claimed is not met because Larsen et al. specifies a

15 weight percent upper limit of antioxidant material. Because Larsen et al. does not contemplate application of an antioxidant coating, any contribution of antioxidant material by introduction of an antioxidant coating would necessarily reduce the permissible amount of antioxidant material in the battery separator before coating. By adding the antioxidant coating of JP '161 in an amount that would exceed the 15 weight percent antioxidant maximum specified, the Examiner's combination violates the teaching of Larsen et al.

JP '161 limits the antioxidant content to no greater than 1 percent and combines the antioxidant with a peroxide decomposition agent. The limited amount of antioxidant in combination with peroxide decomposition agent is required to prevent self-discharge (see paragraphs 12 and 15 of the Pekala declaration).

To support his contention by further example, applicant points the Examiner to U.S. Patent No. 5,051,183 to Takita et al. ("Takita"), which is cited as the primary reference supporting the obviousness rejections set forth in paragraphs 7 and 8 of this Office action. In Takita et al., Example 1 provides 0.375 antioxidant parts by weight and 100 polyethylene parts by weight, which gives an antioxidant material-to-polyethylene ratio of 0.00375. This is again consistent with the lower value applicant contends is typical.

To present evidence of the practice of skilled persons, applicant attaches as an exhibit to this amendment the product applications bulletin titled "Irganox 1010, Antioxidant and Thermal Stabilizer" (1990) of Ciba-Geigy, the manufacturer of Irganox 1010, which the present patent application gives as an example of a suitable antioxidant. The Ciba-Geigy bulletin discusses use of Irganox 1010 as an antioxidant in plastics applications. Figure 4 shows a plot of thermal stability of high density polyethylene as a function of antioxidant concentration. The antioxidant concentration range is 0.01 percent-1.0 percent, which is typical for plastics applications.

There are practical, operational reasons why a 1 percent or lower antioxidant concentration based on polymer mass is a figure of merit a skilled polymer scientist would have used (or would use) in an extrusion process to form a conventional separator web. The percentage of antioxidant is actually desirably lower than 1 percent because of cost (antioxidant material is expensive), cross-contamination issues (e.g., adverse effect on battery function), and sufficiency for carrying out the extrusion process (i.e., no operational reason to increase beyond 1 percent the antioxidant needed to accomplish the extrusion process).

In sum, applicant believes the Examiner's reliance on a general statement of 15 weight percent antioxidant content in relation to an uncoated, lower molecular weight polyethylene battery separator inappropriately trumps the overwhelming evidence of use of less than about 1 weight percent antioxidant content in the prior art of record and the practice of skilled persons making battery separators. Applicant respectfully requests, therefore, that this rejection be withdrawn.

Claims 1-5 stand rejected under 35 U.S.C. § 103(a) for obviousness over U.S. Patent No. 5,051,183 to Takita et al. ("Takita") in view of U.S. Patent No. 6,120,939 to Whear et al. ("Whear"), JP '161, and Larsen et al. as evidenced by International Publication No. WO 97/45365 ("WO '365"). The Examiner states that "Takita teaches a battery separator comprising a polymer web comprising an ultrahigh molecular weight polyethylene . . . [having] sufficient molecular chain entanglement to impart high-strength mechanical properties to the polymer web" and "further comprising (tetrakis[methylene(3,5-di-tert-butyl-4-hydroxyhydrocinnamate] methane) as an antioxidant." (Office action at 6.) The Examiner contends that the use of antioxidant within the web indicates presence of the antioxidant in the interior portion of the web. The Examiner concedes that Takita does not specifically disclose coating of the polymer web with the antioxidant material but again relies on JP '161 for a teaching of immersing the polymer web to coat it with the antioxidant material. The Examiner concludes that it would have been obvious to skilled persons to form the coating material containing an antioxidant material as shown in JP '161. The Examiner also concedes that Takita does not specifically disclose the use of a silica within the polymer web but relies on Whear for a description of "a battery separator comprising a polymer web comprising silica particles . . . [to] lower electrical resistivities of the battery separator." (Office action at 7.) Relying on a motivational statement taken from WO '365, the Examiner concludes it would have been obvious to skilled persons to use silica particles in a polymer web lower electrical resistivities of a battery separator. Finally, the Examiner again uses the Larsen et al. 15 weight percent antioxidant limit to increase the antioxidant material-to-UHMWPE ratio to exceed the 0.17 minimum claimed. Applicant responds as follows to this rejection.

In his argument in support of amended claim 1, applicant described in detail the problems associated with the proposed coating of silica particles as described in JP '161 in a battery separator formed with the 15 weight percent antioxidant limit mentioned by Larsen et al. Applicant's arguments also apply to this obviousness rejection because it

relies on the same approach of combining JP '161 and Larsen et al. to increase the antioxidant material-to-UHMWPE ratio above the 0.17 minimum recited in claim 1. Applicant requests, therefore, that this second obviousness rejection be withdrawn as well.

Claim 6 stands rejected under 35 U.S.C. § 103(a) for obviousness over Takita et al. in view of Whear et al., JP '161, and Larsen et al. as evidenced by WO '365, as applied to claim 1, and further in view of WO '240. Because the premise underlying this rejection is the same as that applied to claim 1, applicant submits that amended claim 1 is patentable for the reasons he gave in his arguments in support of amended claim 1. Applicant requests, therefore, that this third obviousness rejection be withdrawn.

Applicant believes his application is in condition for allowance and respectfully requests the same.

The Commissioner is hereby authorized to charge any additional fees which may be required in connection with filing of these papers, or credit overpayment, to Account No. 19-4455.

Respectfully submitted,

Richard W. Pekala

By 
Paul S. Angello
Registration No. 30,991

STOEL RIVES LLP
900 SW Fifth Avenue, Suite 2600
Portland, OR 97204-1268
Telephone: (503) 224-3380
Facsimile: (503) 220-2480
Attorney Docket No. 27589/8:3